



Research Article

The Cassidinae beetles of Longnan County (Jiangxi, China): overview and community composition

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Abstract

There are few reports on the community composition and diversity pattern of the Cassidinae species of China. Compared to the neighbouring provinces of Guangdong, Fujian and Zhejiang, the Cassidinae richness in Jiangxi Province is under-reported. Longnan City, a biodiversity hotspot in Jiangxi Province, was chosen to obtain the first overview of the Cassidinae beetles. The sample coverage curves for the three sample sites reached an asymptote which indicated sampling was sufficient for data analysis. A total of eight tribes, 16 genera, 59 species and 1590 individuals of Cassidinae beetles were collected. Most belonged to the tribe Hispini (1121 individuals; 70.5%), followed by the tribe Cassidini (161 individuals; 10.13%) and the tribe Oncocephalini (159 individuals; 10.0%). The remainder (149 individuals) belonged to five tribes (Gonophorini, Basiprionotini, Callispini, Notosacanthini and Aspidimorphini). The tribes Notosacanthini, Aspidimorphini and Oncocephalini were newly recorded for Jiangxi Province. There were 14 families, 27 genera and 39 species of host plants of Cassidinae beetles in Longnan County. Cassidinae larvae mainly feed on the plant families Poaceae, Rosaceae, Lamiaceae and Rubiaceae. Most host-plant associations are new records for the beetle species. This research, together with our planned future work in China, may help to explain the geographical distribution, diversity patterns and host plant associations of these beetles.

Keywords

Cassidinae, Hispini, Cassidini, host plant, Longnan County

Introduction

With more than 6000 species, Cassidinae s. l. is the second most diverse subfamily of Chrysomelidae (Chen et al. 1986, Flinte et al. 2009b, Liao et al. 2015, Staines 2015, Borowiec and Świętojańska 2019). The subfamily consists of the hispine beetles (Hispinae s. str.) and the tortoise beetles (Cassidinae s. str.) (Staines 2002). Cassidinae are widely distributed, but are most abundant in the tropical and subtropical regions of South America (Chaboo 2007). Cassidinae show strong adaptability in their host plants; for example, the leaf-mining Hispines feed on more than 80 families and 800 species (Liao et al. 2015). Some species of Cassidinae are important agricultural and forestry pests (Chen et al. 1986). *Dicladispa armigera* (Olivier) was a primary pest on rice, *Oryza sativa* L., in south-eastern China (Chen et al. 1986, Li 1990); *Dactylispa setifera* (Chapuis) was a major pest of corn, *Zea mays* L., in Guangxi in 1960s-1970s, as well as in the 1990s (Chen et al. 1986, Zhang and Lu 1990); *Platypria melli* Uhmann has severely damaged the leaves of Rhamnaceae fruit trees *Hovenia acerba* Lindl. and *Ziziphus jujuba* Mill. (Chen et al. 1986, Liao et al. 2014); *Cassidispa relictata* Medvedev is a severe threat to the dominant trees, *Betula platyphylla* Sukatchiev and *Ulmus pumila* L., in Inner Mongolian forests in recent years (Liao et al. 2018b). Invasive Cassidinae species such as palm-feeding *Brontispa longissima* (Gestro) and *Octodonta nipae* (Maulik) are substantial threats to economic crops and native plants (Peng et al. 2018, Zou et al. 2019).

Before the 1960s, the species of Cassidinae occurring in China were identified and reported by foreign taxonomists, including Baly J.S., Boheman C.H., Gestro R., Gressitt J.L., Hincks W.H., Kimoto S., Maulik S., Spaeth F., Uhmann E. and Weise J. (Chen et al. 1986, Sekerka et al. 2016). Since the 1960s, Chinese entomologists have reported many new species and records (Chen et al. 1986). However, only a few systematic monographs on the Chinese Cassidinae fauna at either a whole-country scale or regional scale have been published since the 1950s (Gressitt 1950, Gressitt 1952, Gressitt and Kimoto 1963, Chen et al. 1986, Kimoto and Takizawa 1997, Lee and Cheng 2007, Lee and Cheng 2010, Lee et al. 2016, Qi 2009). In 1963, there were 38 genera and 205 species in China (Gressitt 1950, Gressitt 1952, Gressitt and Kimoto 1963, Chen et al. 1986). In 1986, the numbers increased to 49 genera and 417 species (Chen et al. 1986). Currently, over 500 Cassidinae species have been reported in China (Kimoto and Takizawa 1997, Hua 2000, Borowiec and Sassi 2002, Świętojańska and Borowiec 2006, Lee and Cheng 2007, Lee and Cheng 2010, Lee et al. 2016, Lee et al. 2009, Lee and Sekerka 2018a, Lee and Sekerka 2018b, Lee 2015, Lee 2009, Lee and Staines 2010, Lee et al. 2011, Lee et al. 2012, Borowiec and Lee 2008, Borowiec and Lee 2009, Borowiec 2009, Aston 2009, Qi et al. 2008, Qi 2009, Staines 2015, Borowiec and Świętojańska 2019, Liao et al. 2018b,

Świętojańska 2001). However, according to our collecting records in recent years, China should have higher Cassidinae richness than reported.

Most studies on Cassidine species occurring in China focus on morphological descriptions, with some with biological information including host plant records and genome composition (Chen et al. 1986, Lee et al. 2009, Qi 2009, Guo et al. 2017a, Guo et al. 2017b, Yang et al. 2017, Yao et al. 2017, Liao et al. 2018a, Liao et al. 2018b, Liu et al. 2018, Peng et al. 2018, Xu et al. 2018), but almost none on community composition and diversity patterns (Chen et al. 1986). Moreover, it was unfortunate for Cassidinae that urbanisation and agricultural activities increased anthropogenic disturbances, which have high negative impacts on their distribution, diversity and dynamics (Nummelin and Borowiec 1992, Ghate et al. 2003, Chaboo 2007, Sánchez-Reyes et al. 2019). Many Cassidinae species had disappeared before being documented. Some natural forests were destroyed for the establishment of economic plantations, for example, *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg., *Eucalyptus* spp. and *Citrus sinensis* (L.) Osbeck, which are marked threats to Cassidinae biodiversity, especially in southern Chinese provinces of Yunnan, Guangxi and Jiangxi (Dai et al., personal observation). Six tribes, 12 genera and 49 species of Cassidinae beetles have been reported in Jiangxi Province (Chen et al. 1986, Zhang et al. 1987). But, However, no particular site in Jiangxi Province has been thoroughly inventoried and no single study has looked at the diversity pattern at different taxonomic levels. Compared to the neighbouring provinces of Guangdong, Fujian and Zhejiang, the Cassidinae richness in Jiangxi Province is under-reported, especially for endemic species (Chen et al. 1986). Since 2012, our Leafminer Group at Gannan Normal University has discovered many new records of Cassidinae species and their host plants in Jiangxi and many other provinces in China (Dai et al. unpublished data). There has been no systematic analysis on the faunal composition and diversity pattern of the Cassidinae beetles in Jiangxi.

The Nanling Mountains are a critical biogeographical line between the mid-subtropical and the south-subtropical zones in China (Zeng et al. 2018). Nanling is also one of the KBAs (Key Biodiversity Areas) in China (Huang et al. 2012, Zhang et al. 2014). Located at the north slope of Nanling Mountains, Longnan County is a representative biodiversity hotspot in Jiangxi Province (Dai et al. 2014, Dai et al. 2013, Dai et al. 2019, Bai et al. 2015, Bai et al. 2016, Liu et al. 2002), with one national nature reserve, six county nature reserves, one national forest park and three provincial forest parks. This research aimed to provide a first overview and a quantitative species list of Cassidinae, estimate their community composition and understand which tribes, genera and species were the most diverse in Longnan County. Our research also could benefit from knowing the effect of human activities on forest biodiversity and providing some information for habitat management and pest control.